NEW SPECIES AND NEW RECORDS OF AUSTRALIAN ATHECATE HYDROIDS

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ABSTRACT: Eight species of Australian athecate hydroids from 6 families including 4 new species are described and discussed. Species newly described include *Tubularia exxonia*, *Rosalinda marlina*, *Merona operculata* and *Stylactis betkensis*. *M. operculata* constitutes a new record for the genus from Australian waters and *R. marlina* provides the first record of the genus for the southern hemisphere. The second record of *Stylactis* in Australia is from an estuarine habitat previously unrecorded for the genus. Augmented descriptions, new distributional and ecological data, and extensions of range are given for 4 species, *Zyzzyzus spongicolus*, *Sarsia radiata*, *Turritopsis nutricula* and *Bimeria australis*, already known from Australia. The hydroid and medusa stages of *T. nutricula* and *S. radiata* are also redescribed.

INTRODUCTION

General: The eight species of athecate hydroids described and discussed in this paper include four new species belonging to four genera. Three of these genera have not been recorded before from Australian waters and the fourth has been recorded from Australia only once previously, from Queensland. Three of the remaining four species are endemic to southern Australia but have not been recorded since their original description; the remaining species is cosmopolitan. New geographic and bathymetric records, and ecological data are given for these already known species.

The athecate hydroid fauna of Australia is poorly known, only 38 species, including 20 endemic species, having been recorded to date from the entire 20,000 km of coastline. Some of these records are doubtful, and a few species, such as *Tubularia pygmaea* Lamouroux were so poorly described from inadequate material that it is unlikely the species will ever be recognised again. Most of the species described from Australia are however, not well known, many having been recorded only once, in their original description. Most are recorded from warm temperate and subtropical waters, while only 9 species have so far been recorded along the southern cool temperate coastline below 34°S, from Sydney to Cape Naturaliste in Western Australia. This apparent paucity of species in southern waters, and indeed all around the Australian coastline, seems to be due more to sporadic collecting activity and lack of interest in athecate hydroids over the past century, and in particular to the crudity of collecting methods employed, than to any lack of abundance or diversity of this group in Australian seas.

Among the earliest systematic accounts of athecate hydroids in the Australian literature were those by R. von Lendenfeld (1884) who described a number of medusae and hydroid colonies from Port Jackson, New South Wales. Unfortunately, some of his descriptions are confusing, while others contain inaccuracies which have undoubtedly led to great difficulties in identification of certain species by later workers. W.M. Bale, Australia's most prolific author on the hydroida, described only 4 athecate hydroids, from Port Jackson, and Port Phillip Bay, Victoria, among the total of 127 species he published in the years 1882-1926 (Smith & Watson 1969). Other workers who have described or recorded athecate hydroids at various times from the southern coast are Gray (1868), Spencer (1891), Stechow (1924, 1925), Blackburn (1937, 1942), Ralph (1966), Watson & Utinomi (1971), and Watson (1973).

With the exception of one estuarine and one deep water species, all material on which this paper is based was collected by the author or others, using SCUBA. Collection and observation *in situ*, supported by close-up underwater photography,

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now permits a much more detailed account of their morphology in life and their ecology, and provides habitat data upon hydroids formerly impossible to obtain through older methods of collecting. All type material and microslides of figured specimens are lodged in the National Museum of Victoria, Melbourne (NMV).

Zoogeography and Ecology: Three of the four species newly described in this paper belong to genera of rare occurrence and of restricted distribution on a world scale. *Merona* has hitherto been known only from *M. cornucopiae*, a species occurring in widely separated localities in the northern hemisphere, the Shetland Isles, the Mediterranean, the Pacific and Atlantic coasts of North America, the Seychelles, in the tropical Indian Ocean, and from the Agulhas Bank between the Indian and Atlantic Oceans. The range of *Zyzzyzus*, known to date only from *Z. solitarius*, a rare South African species, occurring also in the Cape Verde Islands and Trinidad, is now extended to include temperate and cool temperate Australian seas.

Rosalinda, here recorded for the first time from the southern hemisphere, was formerly known from two species restricted to the Bay of Biscay (*R. williami*), and the North Sea (*R. incrustans*). The new species of *Rosalinda* described here also extends the bathymetric range of the genus from deep water (440 m) upward to shallow depths (10 m), well within the zone of wave action.

Stylactis, with fifteen species, is recorded from the North Atlantic, the Atlantic coast of North and South America, the Mediterranean, Japan, Indo- and Central Pacific regions, the Queensland coast of Australia, and doubtfully from South Africa. Only three species, including the doubtful record from South Africa, are recorded from subequatorial waters of the southern hemisphere. The species of *Stylactis* display a wide bathymetric range, occurring from the littoral, where the genus is most commonly recorded, to the archibenthal zone. The present record is, however, the first of the genus from a brackish water habitat.

Turritopsis nutricula is a well known species of cosmopolitan distribution which has been recorded under three synonyms in Australia. Its presently known distribution is along the southeastern and southern coastline; it has not yet been recorded from tropical Australia.

Bimeria australis and *Sarsia radiata* on present knowledge seem to have a localised distribution in the southeastern corner of Australia, but this may reflect lack of collecting effort rather than a true distributional pattern. For example, *S. radiata*, not recorded since its original description in 1884, now proves to be a common species of seasonal occurrence and it is to be expected that it should be widely distributed through its medusa stage along the southern coastline. Observations on the three previously recorded Australian species (*S. radiata*, *T. nutricula*, *B. australis*) show that all establish hydroid colonies during the southern Australian winter. *S. radiata* liberates medusae during the period of lowest water temperature (11°-13°C), while medusae of *T. nutricula* swarm in coastal and ocean water during the summer months (16°-18°C). In winter, *T. nutricula* and *B. australis* hydroids are particularly abundant, occupying similar habitats in places sheltered from surge with low irradiance. *S. radiata* seems to be capable of occupying habitats where there is mild surge, and since it is tolerant of much higher irradiance levels, it is found in clearer, more oceanic waters. The colonies of *S. radiata*, however, never attain the same luxuriance of growth as shown by that of *T. nutricula* or *B. australis*.

LIST OF SPECIES

	Locality
F. TUBULARIIDAE	
Tubularia exxonia n.sp.	Eastern Bass Strait.
Zyzzyzus spongicolus (von Lendenfeld, 1884)	Port Jackson, New South Wales; Port Phillip Bay, Victoria.
F. CORYNIDAE	
Sarsia radiata von Lendenfeld, 1884	Port Jackson, New South Wales; Port Phillip Bay, Victoria.
F. ZANCLEIDAE	
Rosalinda marlina n.sp.	Eastern Bass Strait.
F. CLAVIDAE	
Merona operculata n.sp.	Westernport Bay, Victoria.
Turritopsis nutricula McCrady, 1856	Port Jackson to Shark Bay, Western Australia.
F. BOUGANVILLIDAE	
Bimeria australis Blackburn, 1937	Southern Queensland to Bass Strait
F. HYDRACTINIIDAE	
Stylactis betkensis n.sp.	Mallacoota, southeastern Victoria.

SYSTEMATIC DESCRIPTION

Family TUBULARIIDAE

Tubularia exxonia n.sp.

(Fig. 1,A,B.)

TYPE MATERIAL AND RECORDS: Holotype, NMV G2800 microslide; NMV G2801 preserved material, remainder of holotype colony, Marlin Oil Platform, eastern Bass Strait, 75 m deep, on sponge; coll. Natural Systems Research Pty. Ltd., 2/9/75.

DESCRIPTION FROM HOLOTYPE: Hydrorhiza a matted reticulum penetrating 5-6 mm into the surface of horny sponge, perisarc of hydrorhiza thick. Stems simple, perisarc thick proximally, becoming thinner distally, reaching a height of 2-3 mm above surface of sponge. Width of stem below hydranth, 0.15-0.25 mm. Hydranth variable in shape, capable of great distension, from globular to spindle shaped. Length of body including oral tentacles (preserved) 0.7-1.0 mm; width 0.3-0.5 mm (hydranth partially distended). Tentacles filiform, 12-14 aboral, 0.75-1.25 mm long and 0.06-0.1 mm wide at base, and 13-15 short oral tentacles 0.25-0.35 mm long; inner surface of aboral tentacles furnished with conspicuous pads of nematocysts (stenoteles, none discharged).

Gonophores cryptomedusoid, borne in tight clusters of 10-12 in various stages of development on a short blastostyle arising between the bases of aboral tentacles. Mature gonophores irregularly elongate, but individual shape variable due to pressure of surrounding gonophores. Length of mature gonophore 0.2 mm.

COLOUR: Body of hydranth and tentacles translucent white, gonophores pink (preserved).

REMARKS: *T. exxonia* does not resemble any other tubularian hydroid known from Australia. The small size of the stem and hydranth and the rather solitary, sparse colonies are characteristics which distinguish it from other known species of *Tubularia*.

The genus *Tubularia* as known at present is represented in Australia by five species. These are *T. ralphii* Bale, 1884, recorded in Port Phillip Bay, *T. pygmaea* Lamouroux, 1816 (described from stems without hydranths and therefore unlikely ever to be recognised again), *T. australis* Stechow, 1924, (= *T. gracilis* von Lendenfeld, 1884) from Port Jackson and Western Australia, *T. larynx* Ellis & Solander, 1768, doubtfully recorded from Port Phillip Bay by Ralph (1966) and from the Great Australian Bight by Watson (1971), and *T. crocea* Agassiz, 1862, doubtfully recorded from Moreton Bay, Queensland by Pennycuik (1959).

It is certain that further intensive collecting using SCUBA will greatly add to the number of species of *Tubularia* known from Australian waters.

Zyzzyzus spongicolus (von Lendenfeld, 1884)

(Fig. 1, C-M)

Tubularia spongicola von Lendenfeld, 1884: 597, pl.26, fig. 50.

Von Lendenfeld (1884) described and figured a hydroid, *Tubularia spongicola*, from Port Jackson, New South Wales. In several respects his description, including relative length of the aboral and oral tentacles, and the 'serrated umbrella margin' of the 'medusostyls', does not agree with his figure. Examination of the preserved type material, and other material of *T. spongicola* held in the Australian Museum, Sydney (Reg. Nos. G10809, G10798) reveals that neither von Lendenfeld's description nor his figure agree with the actual material. The figure of *T. spongicola* shows 24 long aboral and 24 shorter oral tentacles whereas the aboral tentacles in the preserved material number 16. The specimens are too poorly preserved to count the oral tentacles. In his description, von Lendenfeld states that the oral tentacles are about twice as long as the aboral tentacles. He also states that the blastostyles are unbranched, although the type material bears small clusters of gonophores. The gonophores are elongate oval and show no sign of a serrated margin, nor do they resemble the distally flattened cups depicted in his figure. His description of a 'light brown perisarc', and a 'creeping hydrorhiza . . . immersed in horny sponges' is further misleading, since the perisarcal sheath is very delicate and almost transparent. The hydranths are quite clearly solitary and rooted in the sponge by finger-like hydrorhizal processes. It is surprising that von Lendenfeld failed to notice this unique character of the hydrorhiza.

Stechow (1921) erected the genus *Zyzzyzus* (type species *Tubularia solitaria* Warren, 1906) for a hydroid from South Africa without hydrorhiza and liberating actinulae. *Z. solitarius* has since been recorded in the Indian Ocean and Cape Verde Islands (Ritchie 1907), and Trinidad (Millard 1975), as a monospecific genus.

Living material collected from sponges in Port Phillip Bay, Victoria and along the New South Wales coastline by the author is undoubtedly conspecific with von Lendenfeld's species and is referable to *Zyzzyzus*. Although in most respects similar to *Z. solitarius*, the occurrence of both male and female gonophores on the same blastostyle distinguish it from that species.

A redescription of *Z. spongicolus* from living and preserved material is given below.

DIAGNOSIS: Hydranths solitary, rooted in the canal system of the host sponge by finger shaped hydrorhizal processes. Hydrocaulus reaching a height of 5-6 mm of which one third is embedded in the sponge. Hydrocaulus stout, covered by a transversely striated transparent sheath of perisarc terminating in a circular groove below hydranth, the coenosarc of the stem divided into about 12 longitudinal canals connecting with the gastral cavity. Hydranth with 12-16 moderately long aboral tentacles, 0.75-1 mm in length (preserved), and 10-12 shorter oral tentacles. Blastostyles arising just above aboral tentacles, each bearing clusters of up to 6 gonophores in different stages of development, male and female on same blastostyle. Immature gonophores of both sexes oval with slightly raised and flattened distal end, the male retaining this shape to maturity. Female gonophore cryptomedusoid, containing up to 6 eggs of which 2-3

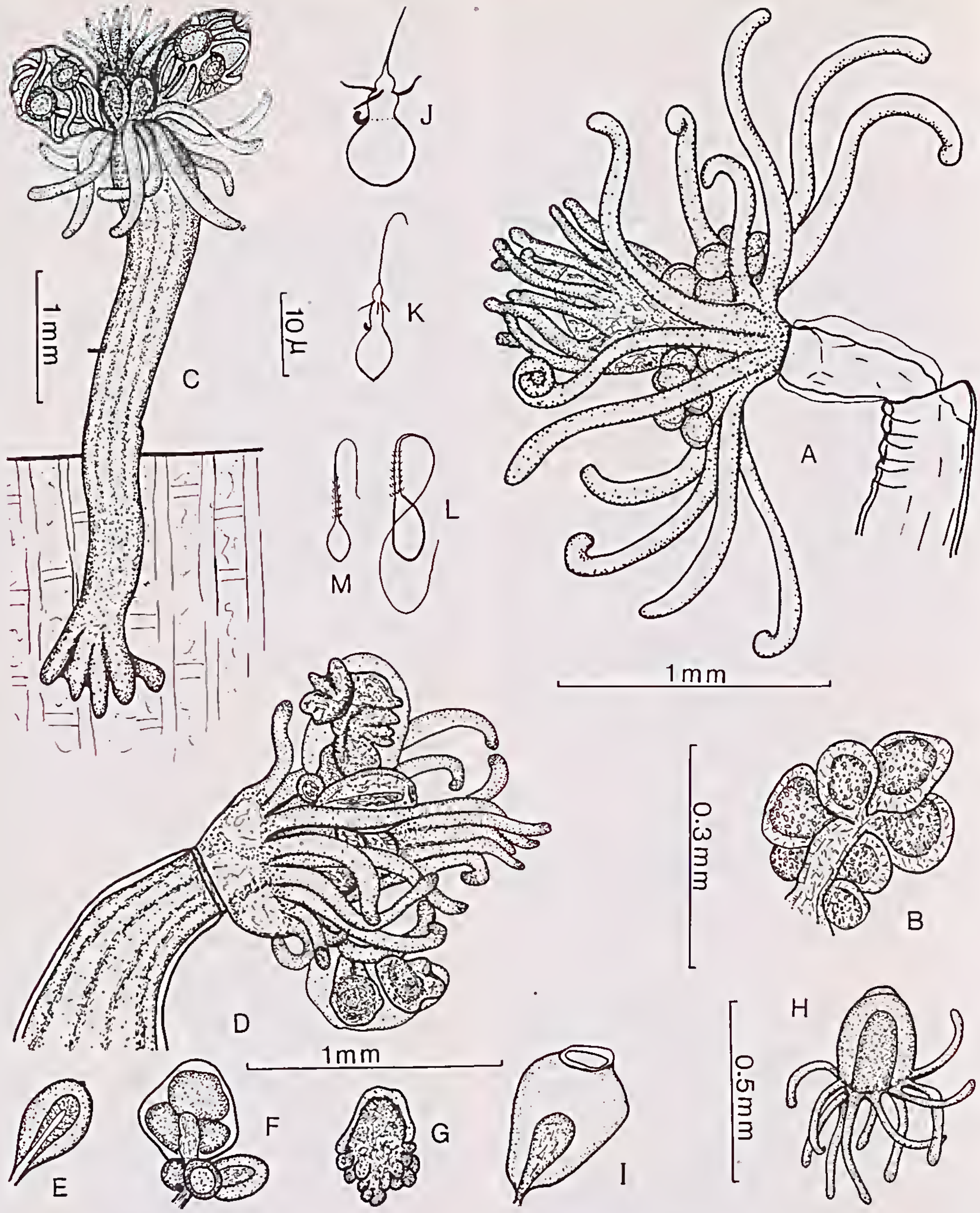

FIG. 1 — *Tubularia exxonia* n.sp. A, hydranth with gonophores; B, cluster of nearly mature gonophores on blastostyle. *Zyzzyzus spongicolus* (von Lendenfeld, 1884). C, fertile hydranth with cut-away section in sponge showing digitate rooting processes; D, detailed view of fertile hydranth with actinulae just prior to liberation; E, male gonophore with sperm cells surrounding spadix; F—I, stages in development of actinula — F, cluster of four gonophores in various stages of development, the largest with three eggs; G, early stage growth with developing tentacle buds (actinula dissected out from gonophore); H, newly liberated actinula, I, empty gonotheca after escape of actinula, spadix still present (D, E, F, I, drawn to same scale); J—M, nematocysts — J, K, stenoteles; L, basitrichous isorhiza; M, heterotrichous anisorhiza.

develop into actinulae *in situ*. Near maturity the female gonophore rapidly enlarges to accommodate the developing actinulae, the outer envelope becoming transparent and irregular in shape, the actinulae clearly visible within. At this stage a circular orifice with raised collar develops at the distal end, and the spadix is pushed to one side. After escape of the actinulae, the spadix remains within the empty gonotheca. At liberation, the actinulae are 0.25-0.3 mm in width across the body with 10-12 long marginal tentacles.

Nematocysts of four kinds are present:

— large stenoteles, very abundant, with spherical capsule, $7.5 - 9 \times 9.5\mu$, butt almost as long as capsule, with 3 large spines.

— smaller stenoteles, also very abundant, capsule a little more elongate, $5.5 \times 3\mu$, butt slender, about two thirds length of capsule.

— basitrichous isorhizas, rare, capsule bean shaped, $8 \times 3.5\mu$, tube long.

— heterotrichous anisorhizas, rare, capsule oval, $3 \times 5\mu$.

COLOUR: Hydrocaulus and tentacles of hydranth translucent white, body of hydranth dull red, gonophores and actinulae at liberation white, spadix of mature female gonophore deep orange.

REMARKS: *Z. spongicolus*, as far as known at present, is associated only with certain species of erect, horny sponges. Although small in size, the hydranths are usually very numerous and thus quite conspicuous on the surface of the sponge. The seasonal range of *Z. spongicolus* is at present unknown but it has been recorded from April to December.

Family CORYNIDAE

Sarsia radiata von Lendenfeld, 1884.

(Fig. 2, A-D)

Sarsia radiata von Lendenfeld, 1884: 583, pl. 20, figs. 31, 32.

RECORDS: Halibut Oil Platform, eastern Bass Strait, mid-littoral and 10 m deep, on mussels *Mytilus edulis planulatus* (Lamarck), coll. Natural Systems Research Pty. Ltd., June, 1975; Cowes, Westernport Bay, on *Sargassum*, 3 m deep, (24/10/71); Popes Eye reef, on sponge, 10 m deep, (20/8/76): both collections, J.E. Watson.

REMARKS: Von Lendenfeld (1884) described *Sarsia radiata* from medusae collected from Port Jackson which he reared through to the hydroid stage, and a hydroid without medusa from the 'laminarian zone' in Port Phillip Bay. There have been no further records of this hydroid since his original description. The lack of records of what now proves to be a relatively common species is perhaps not surprising, as it is difficult to deduce the true nature of the medusa from von Lendenfeld's description and recent collections of fresh material have shown that the hydroid stage is either morphologically very variable, or not well described from the original material.

The tentacles of the medusa, described by von Lendenfeld as 'a little larger than the ocellar bulbs' are shown in his figure as three times the length of the bell, and further, show no sign of the nematocyst clusters or the capitate ends characteristic of *Sarsia*. Medusae liberated from living hydroid colonies collected at Popes Eye reef were observed for two days before death. These displayed sufficient similarity to von Lendenfeld's description and figure of *S. radiata*, in the shape of the bell and stomach, to warrant considering them to belong to this species. The smaller dimensions of the Popes Eye medusae (0.75 mm high, 0.65 mm wide) compared to those of von Lendenfeld (3 mm high, 2.5 mm wide), and the colour differences between manubrium and tentacle bulbs (brown in von Lendenfeld's material, golden in the Popes Eye specimens) could be due either to age or to geographical factors. Although von Lendenfeld nowhere mentions the age of his medusae, it is assumed that his observations were of adult specimens. It is surprising that he fails to mention the bright orange ocelli, a prominent feature of the present specimens.

The hydrorhiza of the hydroid phase is described by him as 'anastomosing', with unbranched stems, brownish coloured perisarc, and hydrocaulus terminating below the hydranth with an oblique margin. The hydranth comprised 6-8 verticils of four tentacles (= 24-32). Although his hydroid material from Port Phillip Bay was infertile, he considered the specimens to be conspecific with *S. radiata* from Port Jackson. The parent hydroid colony associated with the medusae of *S. radiata* collected by the author at Popes Eye reef fails to conform in several respects with von Lendenfeld's description of the hydroid of *S. radiata*; in fact it more closely matches his description of the hydroid of *Sarsia minima* von Lendenfeld, 1884, also from Port Jackson. Most of the material collected from various localities in Westernport Bay, Bass Strait and Port Phillip Bay in Victoria have tentacles clearly arranged in verticils, but the number never exceeds 16, that is, half the maximum described for *S. radiata* by von Lendenfeld. Two single infertile stems also collected from Westernport Bay, and another from Portland in western Victoria (both collections by the author) have hydranths with 24 and 12 tentacles respectively. All this material, while closely resembling *S. radiata* as now known, is infertile, but until fertile material is found and medusae observed, it is not possible to decide if the hydroid of *S. radiata* is indeed a very variable species, or whether in fact, several species are involved.

With information from the wider range of material now available, a redescription of *S. radiata* is given below.

DIAGNOSIS: Hydroid. Hydrorhiza cylindrical, 0.15-0.25 mm in width, creeping on surface of hard substrate, or embedded in the surface of sponge or compound ascidians. Perisarc of hydrorhiza may be thin or quite thick, depending on age of colony. Stems reaching 5 mm in height, 0.12-0.15 mm in width, perisarc variable in thickness, usually thicker proximally, becoming thinner distally, either entirely ridged throughout, annulated, or occasionally, smooth. Stems may be simple, or with one

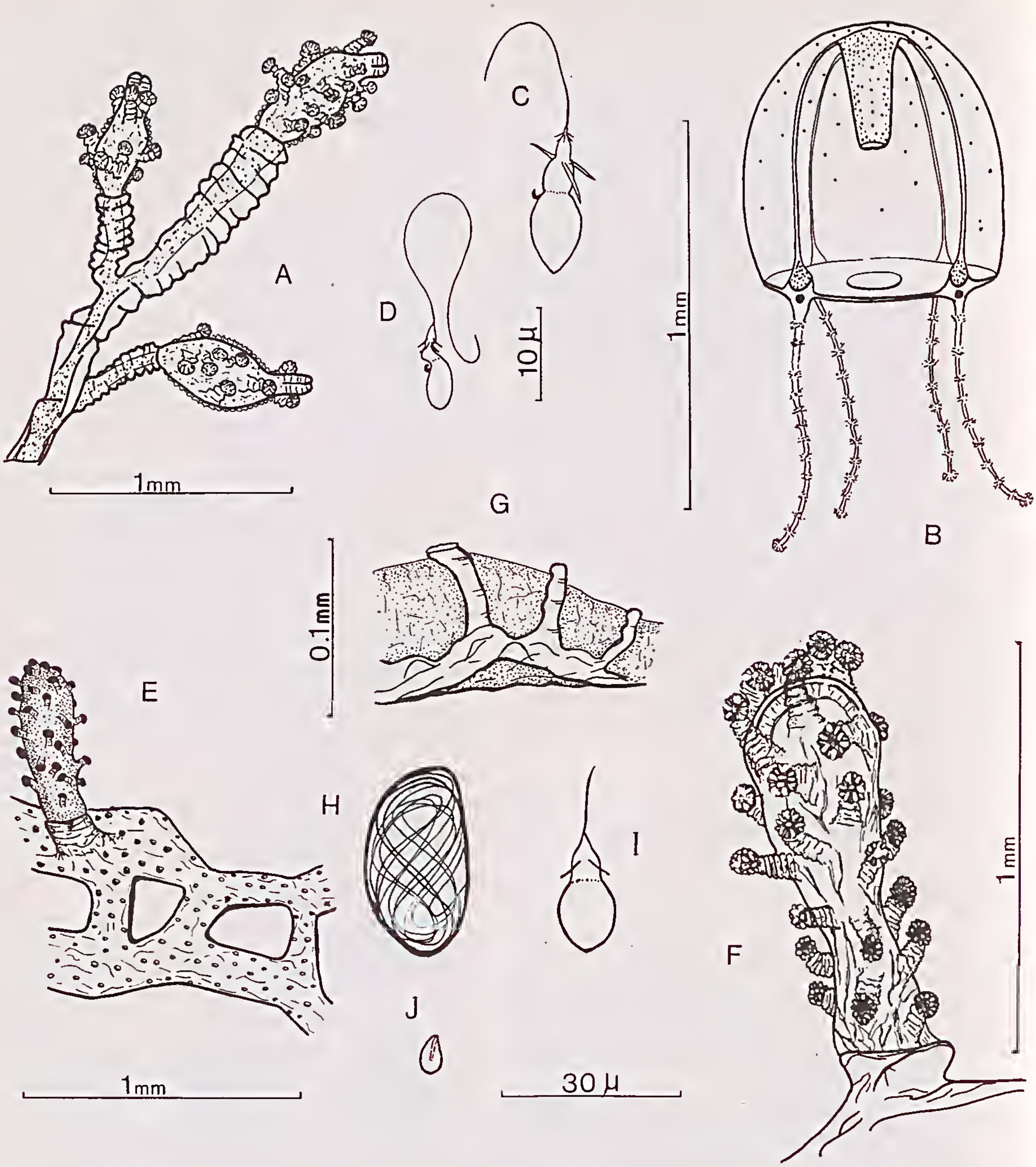

FIG. 2 — *Sarsia radiata* von Lendenfeld, 1884. A, part of colony from Halibut Oil Platform, eastern Bass Strait; B, newly liberated medusa from colonies from Popes Eye reef, Port Phillip Bay, Victoria; C, D, nematocysts from hydroid stage — C, stenotele; D, microbasic eurytele. *Rosalinda marlina* n.sp. E, reticulate hydrorhiza with perisarcal spines and hydranth on barnacle *Balanus trigonus* Darwin: F, hydranth seated in perisarcal cup; G, section through hydrorhiza showing perisarcal tubes extending through hydrorhiza to surface; H–J, nematocysts from hydrorhiza — H, large mastigophore, undischarged; I, stenotele with short spines; J, small ?isorhiza, undischarged.

or two short branches, hydranths terminal. Hydranths spindle shaped in extension, 0.8-1 mm in length, with 12-16 capitate tentacles in 4 or 5 irregular verticils, including 4-5 tentacles around the hypostome. Fertile hydranths contracted, with up to 6 medusa buds in various stages of development.

COLOUR: Body of hydranth orange-pink, tentacles translucent white.

Nematocysts of two types present in hydroid:

— stenoteles, moderately abundant, capsule oval, butt about two thirds length of capsule with 3 long barbs. Length of capsule 7.5μ, width 5μ.

— microbasic euryteles, very abundant, capsule oval, length 4μ, width 2μ, butt about same length as capsule.

MEDUSA: Newly liberated medusa deep bell shaped, symmetrical, umbrella deeper than wide, 0.75 mm high, 0.65 mm wide, jelly moderately thick, apical knob not present. Velum very broad, stomach cylindrical or slightly tapering, less than half the length of bell, mouth simple, circular. Gonads not developed at this stage. Four simple radial canals present, circular canal narrow, passing around the adaxial side of the marginal bulbs. Marginal bulbs large, with well developed ocelli. Tentacles extensile, about same length as bell when fully extended, in contraction about same size as marginal bulbs, with regularly spaced clusters of nematocysts with a large capitate end. Scattered nematocysts on bell in interradial areas, concentrated mainly in the apical region.

Nematocysts of two types present in medusa:

— stenoteles of same shape but larger than those of the hydroid, capsule 11μ long, 8.5μ wide,

— very abundant ?microbasic euryteles, not discharged, 10μ long, 5-7μ wide.

COLOUR: Umbrella and tentacles colourless, stomach deep orange apically, grading through golden to almost colourless at mouth; marginal bulbs golden, ocelli deep orange.

S. radiata is unusual among the *Sarsia* in having microbasic euryteles and not desmoneme nematocysts in both hydroid and medusa.

The range of *S. radiata* is now extended from the Sydney region south to Bass Strait and the Victorian embayments.

Family ZANCLEIDAE

Rosalinda marlina n.sp.

(Fig. 2, E-J.)

TYPE MATERIAL AND RECORDS: Holotype, NMV G2804, microslide, G2805, preserved material, remainder of holotype colony, on ascidian, 36 m deep; paratype, G2806, microslide, on barnacle *Balanus trigonus* Darwin, 10 m deep, all material from Marlin Oil Platform, eastern Bass Strait, coll. Natural Systems Research Pty. Ltd., June 1974.

DESCRIPTION FROM HOLOTYPE AND PARATYPE: Hydrorhiza an encrusting mat of coenosarc which may be continuous or reticulating depending upon the nature of the substrate, but enveloping pre-existing material such as the stolons of other hydroid species. Hydrorhiza closely following the contours of the underlying substrate, but not strongly adherent, being separated from it by a very thin chitinous sheath. Upper surface of hydrorhiza uneven, with rare blunt ectodermal prominences and numerous small projecting hollow chitinous spines. The spines comprise thick brown coloured perisarc, 0.01-0.02 mm diameter, originating in the coenosarc and may be entirely solitary, or connected together in groups of 2-4 by small chitinous tubes about the same diameter as the spines, or they may arise from an incipiently developed chitinous trabeculate meshwork buried within the coenosarc.

Hydranth club shaped or cylindrical (in contraction), 1.25-2 mm in length (preserved), greatest width 0.15-0.3 mm, usually in distal third, hypostome dome shaped. Tentacles 40-45 in number, capitate, scattered over hydranth, with highest density in the region of the hypostome, but not comprising an oral whorl. Extended tentacles 0.13-0.18 mm long, stout, wrinkled, capitulum 0.04-0.06 mm diameter, richly supplied with nematocysts. Hydranth entirely naked, or seated on a rudimentary hydrophore of ectodermal origin reaching 0.1 mm high.

Nematocysts of three kinds present:

— large bean shaped mastigophores, all undischarged, 25 x 15μ – 30 x 20μ, very abundant, especially around the base of the hydranth,

— stenoteles, capsule round, 10 x 8 — 11.3 x 8.8μ, not clearly seen but some discharged; scattered throughout coenosarc of hydrorhiza,

— small ?isorhizas, none discharged, capsule 5 x 3.8μ, scattered throughout hydrorhiza, and probably also in the tentacles.

REMARKS: The genus *Rosalinda* was erected by Totton (1949) for the reception of *Rosalinda williami* Totton, 1949, an epizoic hydroid displaying no polymorphism, and of encrusting habit. The two species so far recorded in this genus are *R. williami* and *R. incrustans* Kramp, 1947. The characteristics of the genus and both species comprising it were redescribed and discussed in detail by Vervoort (1966), who considered that the trabeculate framework of the hydrorhiza, permeated by the coenosarc, was evidence of affinity with the Solanderidae. He earlier (1962) commented on the presence of 'giant nematocysts' in the basal encrustation and later described them in more detail (Vervoort 1966), commenting that 'so far, *Rosalinda* seems to be the only hydroid genus endowed with macrobasic mastigophores'.

Bouillon (1974) considered the possession of these nematocysts to be a far more important characteristic for family definition than the character of the hydrorhiza and accordingly transferred *Rosalinda* to the Zancleidae. The opinion of Bouillon is accepted here; however there is still no information upon the reproductive structures which would allow a final decision to be made on the familial status of the genus.

Two structures found in the limited material available

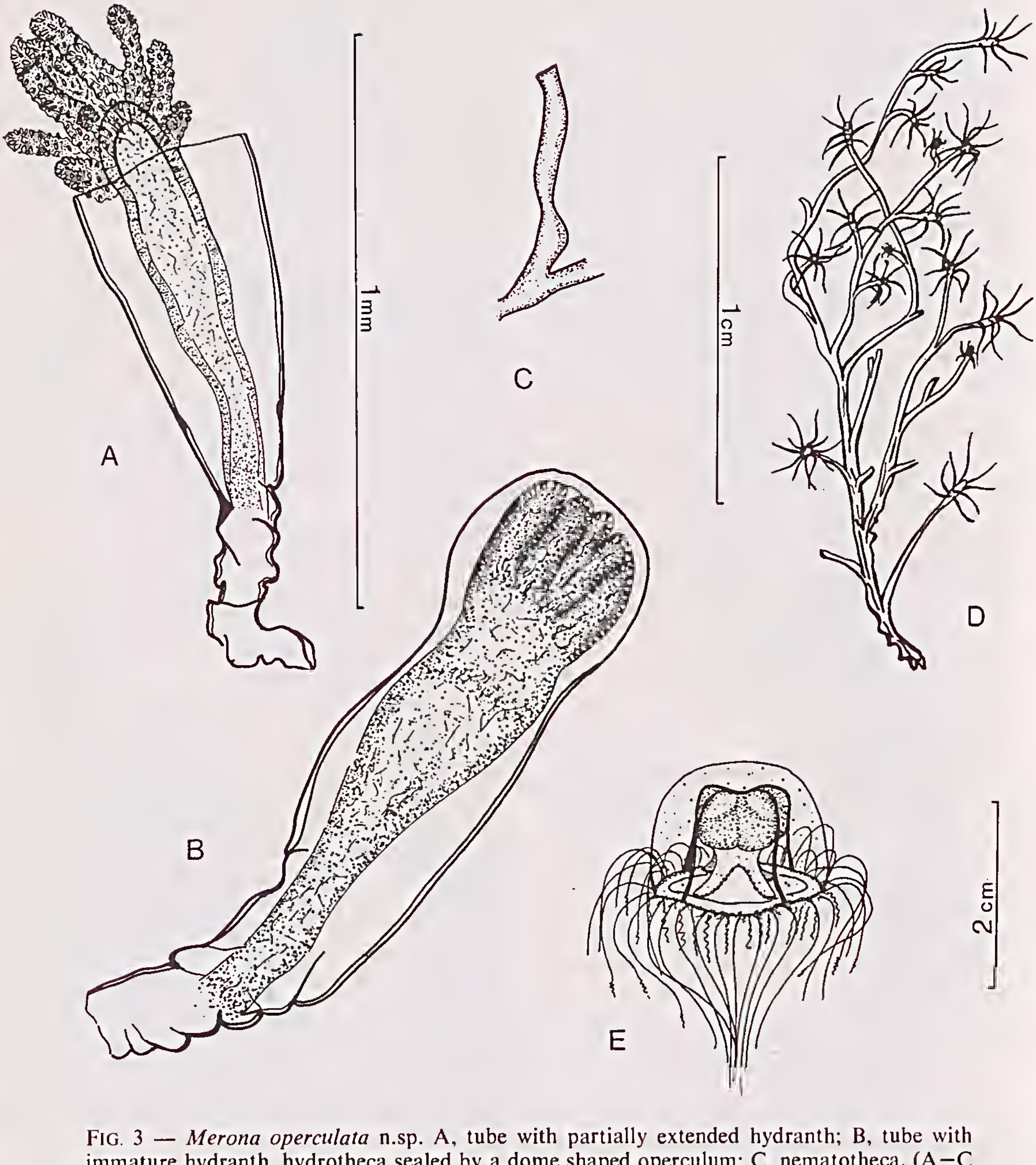

FIG. 3 — *Merona operculata* n.sp. A, tube with partially extended hydranth; B, tube with immature hydranth, hydrotheca sealed by a dome shaped operculum; C, nematotheca. (A–C drawn to same scale.) *Turritopsis nutricula* McCrady, 1856. D, part of colony from Westernport Bay, Victoria, drawing from photograph of living colony *in situ*; E, medusa with well developed gonads and numerous tentacles, drawn from living specimen from Backstairs Passage, South Australia.

for study could possibly be dactylozooids, but due to extraneous growth and the investing nature of the hydrorhiza, these could not be ascribed with any certainty to the hydroid. Should further material show conclusively the presence of polymorphism among the colonies of *R. marlina*, then the species should rightly be transferred to *Teissiera* Bouillon, 1974.

Vervoort (1966) described *R. williami* as having a plate-like skeleton resulting from the junction of a rectangular meshwork of internal walls, the upper surface of which are sometimes produced into ribs and short rounded spines. In *R. incrustans* the ribs are less elevated at the surface of the hydrorhiza, the protrusion of the ribs and spines seemingly being more an expression of the topography of the underlying substrate than a primary structural character of the hydrorhiza. Except for one small area where there are a few incipiently developed buttress-like chitinous walls within the coenosarc, the hydrorhiza of *R. marlina* is entirely devoid of the trabeculate framework described for either *R. williami* or *R. incrustans*. Further, the hollow spines in *R. marlina* have no counterpart in the other two species, the spines of *R. williami* being short and rounded, while in *R. incrustans* spines of autochthonous origin seem to be absent (Vervoort 1966). The abundant slender tubular spines of *R. marlina* have a thick strong perisarc, and where the chitinous internal meshwork is developed, the spines arise directly from these structures. Where the meshwork is absent, groups of 2-4 spines are joined together at their bases by irregularly winding short tubes. Some spines are solitary, and these arise directly to the surface from the underlying chitinous basal membrane of the hydrorhiza.

As in *R. williami* and *R. incrustans*, the hydrorhizal coenosarc of *R. marlina* is richly supplied with nematocysts. Vervoort (1966) records macrobasic mastigophores and stenoteles of two sizes in *R. williami*, while in *R. incrustans* there are numerous isorhizas as well. The macrobasic mastigophores of *R. marlina* are the smallest of the three in size, and the stenoteles are about the same size as the smaller ones of *R. williami* and *R. incrustans*. The numerous very small but undischarged nematocysts of *R. marlina* are thought to be isorhizas since they strongly resemble the isorhizas of *R. incrustans* in shape, although they are only half the size of those of the latter species.

A comparison of the nematocysts and their dimensions in the three species is given below. Dimensions are in μ.

Species	Macrobasic Mastigophores	Stenoteles (large)	Stenoteles (small)	Isorhizas
R. williami	24 x 36	18 x 25	9 x 13	
R. incrustans	25 x 35	22 x 18	10 x 7 – 13 x 9	8 x 18
R. marlina	15 x 25 – 20 x 30		10 x 8 – 11 x 9	4 x 5

In size of the hydranth, number of tentacles and general aspect of the colony, *R. marlina* shows a greater resemblance to *R. incrustans* than to *R. williami*. However the difference in size of the nematocysts, the presence of tubular spines and the general structure of the hydrorhiza clearly distinguish *R. marlina* from both species.

R. marlina and *R. incrustans* are both epizoic species, *R. marlina* being taken in shallow water at a depth of 10 m on the shell of a barnacle, and at 36 m on an ascidian; *R. incrustans* was taken from a crab collected at a depth of 225 m in the North Sea. *R williami*, while not strictly epizoic, is also a deep water species, collected from a cable at a depth of 440 m in the Bay of Biscay.

This is the first record of the genus from the southern hemisphere.

Family Clavidae

Merona operculata n.sp.

(Fig. 3, A–C.)

Type Material and Records: Holotype, NMV G2807, microslide, Crawfish Rock, Westernport Bay Victoria, 10 m deep, on compound ascidian *Didemnum patulum* (Herdman), coll. J.E. Watson, 30/7/67.

Description from Holotype: Gastrozooids sheathed in a firm conical tube which may be straight or curved, perisarc of the tube moderately thick, strongly wrinkled proximally, smooth or a little undulated distally, aperture transverse. Length of tube 0.88–1.25 mm, width at aperture, 0.27–0.35 mm. Hydranth extensile, capable of contraction into tube, with about 10 filiform tentacles surrounding a club-shaped hypostome. Tentacles 0.15 mm long fully extended, with a clearly defined distal cap 0.04–0.05 mm wide richly armed with nematocysts (type unknown).

Nematophores present, supported on a long tubular pedicel of perisarc 0.4 mm long arising from the hydrorhiza, distal end widening slightly to form nematotheca. Diameter of nematotheca 0.05 mm. No nematocysts present in empty nematotheca.

Gonophores absent. Colour unknown.

Remarks: The small sample available in this collection is infertile and is devoid of any extensive hydrorhiza. A small fragment adhering to the base of one perisarcal tube suggests that the hydrorhiza may be tubular in structure. One hydrotheca containing an immature hydranth is enclosed in a dome shaped structure continuous with the perisarc of the tube. This protective 'operculum' apparently breaks away along a line of weakness marked by inflexure across the wall of the tube, allowing emergence of the mature hydranth.

In the absence of fertile material it is difficult to make a decision as to whether clavate hydroids with a protective tube belong to *Tubiclava* or *Merona*. However the retractable hydranths and the single nematotheca arising from the hydrorhiza provide sufficient basis for reference of this species to *Merona*.

Merona cornucopiae (Norman 1864) has been the only species of the genus so far recorded. It has been fully described and discussed by a number of authors (Kramp 1935, Cabioch 1965, Christiensen 1972, Millard 1975). It has a wide distribution in the northern hemisphere, including the North Sea, North Atlantic, Mediterranean, Pacific and Atlantic coasts of North America; it has been recorded in the southern hemisphere only from South Africa. *M. cornucopiae* is usually associated with living molluscs.

While generally similar to *M. cornucopiae*, *M. operculata* has fewer tentacles than the minimum of 16 recorded for *M. cornucopiae*, and these are concentrated in the oral region, in contrast to the scattered distribution characteristic of *M. cornucopiae*. The tube of *M. operculata* is similar in width to *M. cornucopiae*, but is much shorter, and is heavily wrinkled in the proximal region. The single nematotheca also comes within the size range of *M. cornucopiae*, but the funnel-shaped distal end characteristic of that species is absent.

This is the first record of the genus from Australian waters and the first record of its association with an ascidian.

Turritopsis nutricula McCrady, 1856

(Fig. 3, D, E.)

Oceania (*Turritopsis*) *nutricula* McCrady, 1856: 55, pls. 4, 5.
Turritopsis lata von Lendenfeld, 1884: 588, pl. 22, fig. 36.
Turritopsis chevalensis Thornley, 1904: 109, pl. 1, fig. 4. Stechow, 1924: 69; 1925: 198.
Turritopsis dohrni Blackburn, 1937: 178, figs. 15, 16.
Turritopsis nutricula Russell 1953: 115, figs. 54–56, pl. 5, figs. 1–5, pl. 29, figs. 1–3. Millard, 1975: 76, fig. 24 F–G.

REMARKS: Stechow (1925) recorded *Turritopsis chevalensis* Thornley, 1904, from Shark Bay and the mouth of the Swan River, Western Australia, remarking that further collections would be likely to prove that *T. chevalensis* and *T. dohrni* are synonyms of *T. nutricula* McCrady, 1856. Blackburn (1937) recorded this hydroid as *T. dohrni* Weissmann, 1883, from Westernport Bay, Victoria. Blackburn's material was meagre, and although fertile, it was insufficiently mature to enable him to diagnose accurately the medusoid structure of the gonophores.

Observations by diving, over several years, have established that *T. nutricula* is one of the commonest hydroids in the sheltered waters of Westernport Bay, where it grows abundantly on invertebrate and algal substrates on reef and man-made structures between 3 and 25 m depth. It has also been observed by the author in ocean waters of Victoria and New South Wales at various depths where it grows in situations of low light intensity under ledges, in caverns, and in cavities in the underside of flat boulders on the seabed. The strongly fascicled colonies grow to a height of 3–4 cm during the winter months. The hydranths are rose pink and the tentacles white.

The medusa of *T. nutricula* has been known from South Australian waters for many years where it occurs in dense swarms during the summer months (January to March). The adult medusa is 1.5–2 cm across the bell, has at least 100 tentacles, and the large gonads are rose red. The medusa is an energetic swimmer. The hydroid stage is so far unrecorded from South Australia.

Von Lendenfeld's (1884) description of the medusa of *T. lata* from Port Jackson, and his comments on its swarming habit during the summer months leaves no doubt that *T. lata* is a synonym of *T. nutricula*.

New records of hydroid and medusa now extends the range of this cosmopolitan species around the southern half of Australia from Sydney to Shark Bay. It has not yet been recorded from Australian tropical waters.

Bimeria australis Blackburn, 1937

(Fig. 4, A–F.)

Bimeria australis Blackburn, 1937: 177, figs. 10–12. Pennycuik, 1959: 164.

RECORDS: Popes Eye reef, Port Phillip Bay, 7 m deep, on octocoral *Telesto smithi* (Gray) and hydroid *Parascyphus simplex* (Lamouroux), coll. J.E. Watson, 31/5/76; North Arm channel, Westernport Bay, 3–15 m deep on bryozoa *Amathia biseriata* Krauss, on solitary and compound ascidians and other hydroids (J.E. Watson, 1973, 1976); Portland, Victoria, on *A. biseriata*, 7 m deep (J.E. Watson, 9/6/68); 80 km off Warrnambool, Victoria, 310 m deep, on compound ascidian (V. Johnstone, 14/5/69).

MATERIAL: All specimens conform to Blackburn's description of *Bimeria australis*. The following observations augment Blackburn's description.

Maximum length of stems, 4 mm, branching irregularly alternate, a single hydranth usually terminal on branch. Stem and branches may be annulated or wrinkled, the annulations being more distinct proximally, but parts of stems, particularly those from deeper water, may be smooth. Hydranths not distinctly set off from stem, but this is frequently difficult to observe due to infolded habit of tentacles when preserved, and the heavy coating of foreign matter on and below the hydranth. The proximal half of the tentacles of preserved specimens is always obscured by adherent agglutinated material, but close-up underwater photographs show that in life the tentacles are capable of considerable extension beyond this protective sheath.

Gonophores arising singly on a short pedicel from stems, branches and hydrorhiza. Mature gonophores 0.2–0.28 mm diameter, globular or sometimes slightly flattened in section, covered in a thick gelatinous envelope heavily coated in foreign material. Male and female gonophores fixed sporosacs, borne on same stems, female with a bright red spadix in the proximal region supporting a single egg which develops into a planula *in situ*. Male gonophore spherical; radical canals and tentacles rudiments absent.

Nematocysts rare in hydroid, of three types:

— large stenoteles, capsule oval, 7 x 5.5 –10 x 9 μ, butt about half the length of capsule,

— smaller stenoteles, capsule spherical, very rare, 3 μ diameter,

— microbasic mastigophores, capsule bean-shaped, 7 x 4.5 μ in length, tube long.
The stenoteles are concentrated in the tentacles and the mastigophores are scattered throughout the coenosarc of the hydrocaulus.

COLOUR: The colonies are uniformly buff coloured from the adherent matter, but parts of the hydranths visible are pinkish and tentacles white (from colour photographs *in situ*); gonophores white, spadix of female bright red. Specimens from deeper water are more uniform pink in colour than those from shallow water.

REMARKS: This is a very common epizoic species occurring during late winter months (July-September) in Victorian waters when temperatures are lowest. It occurs in large colonies in sheltered situations in embayments where light penetration is poor, such as jetties, and in caverns and under rocks in the ocean. It frequently occupies the same habitat as *Turritopsis nutricula*.

Nematocysts are extremely rare in *B. australis*. Possibly the protection afforded to the hydranths and gonophores by the thick encrustation of foreign material obviates the necessity for production of large concentrations of nematocysts.

B. australis is now known from the embayments, coastal, and deeper waters of the Victorian coastline. Further collections will almost certainly extend its range westwards along the southern coastline.

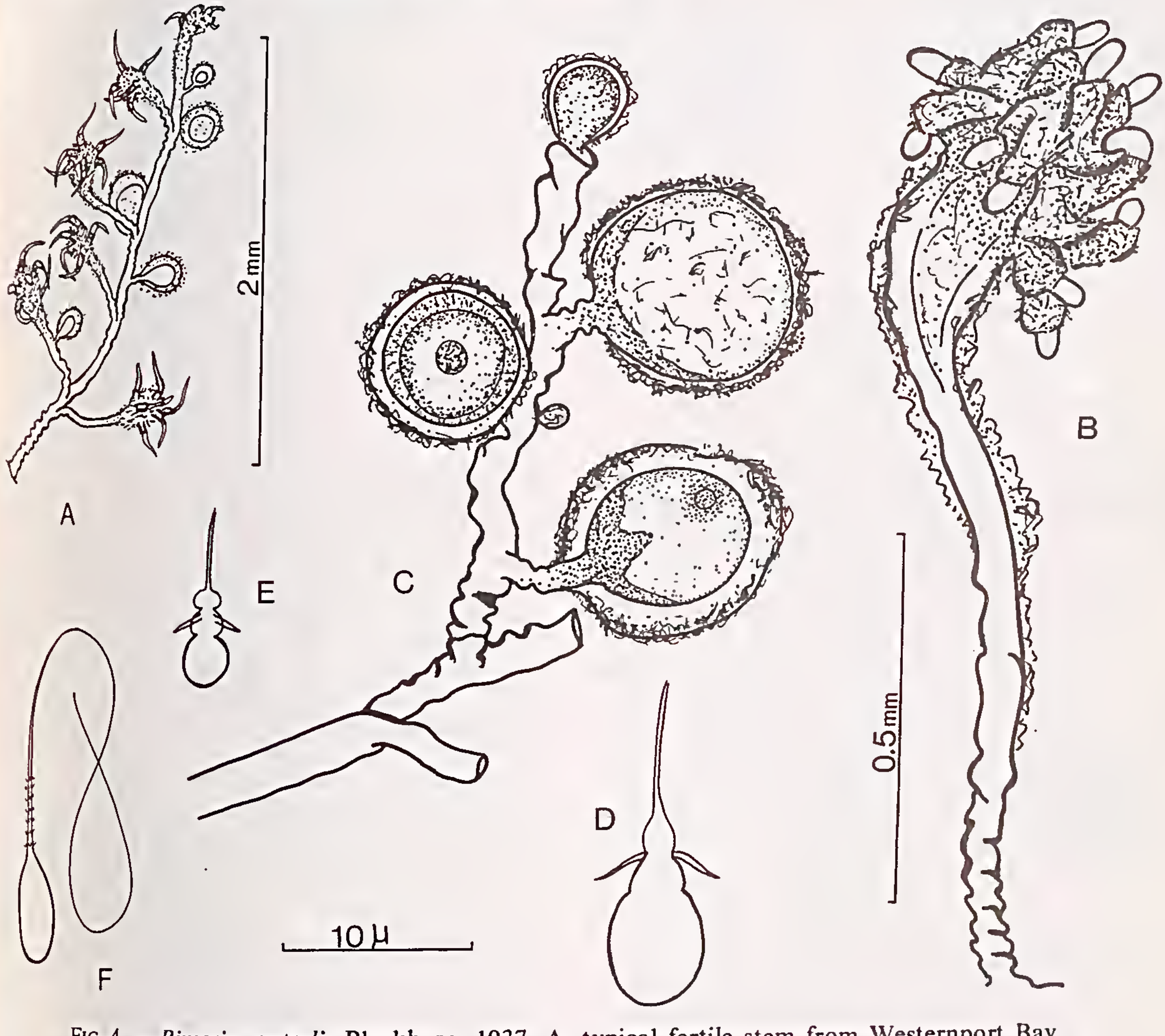

FIG. 4 — *Bimeria australis* Blackburn, 1937. A, typical fertile stem from Westernport Bay, Victoria, drawn from photograph of living colony *in situ*, showing extension of tentacles in life; B, enlargement of hydranth from preserved material from Popes Eye reef, Port Phillip Bay, Victoria, showing body and tentacle sheaths with covering of adventitious matter; C, fertile stem with one male and two female gonophores, each female gonophore containing a single ripe egg (B and C drawn to same scale); D—F, nematocysts from hydranth — D and E, large and small stenoteles; F, microbasic mastigophore.

Stylactis betkensis n.sp.

(Fig. 5, A–H.)

TYPE MATERIAL AND RECORDS: Holotype, NMV G2808, microslide, female colony on gastropod *Parcannassa burchardi* (Philippi); NMV G2809, preserved material, remainder of holotype collection. Paratype, NMV G2810, preserved male and female colonies from same collection. Betka River, Mallacoota, Victoria, in estuarine section, just subtidal in *Zostera muelleri* beds. Coll. R. Plant, February, 1973.

DESCRIPTION FROM HOLOTYPE AND PARATYPES: Colonies comprising gastrozooids and gonozooids arising from a reticulate hydrorhiza following the hollows and sutures of the host shell. Hydrorhiza cylindrical, approximately 0.1 mm diameter, perisarc brown, moderately adherent to shell. Gastrozooid variable in shape and length but usually rather long, reaching 1.2 mm (preserved), slender proximally, expanding to maximum width midway or in distal third of length, then contracting to hypostome. Hypostome well defined, with four radially disposed segments which extend longi-

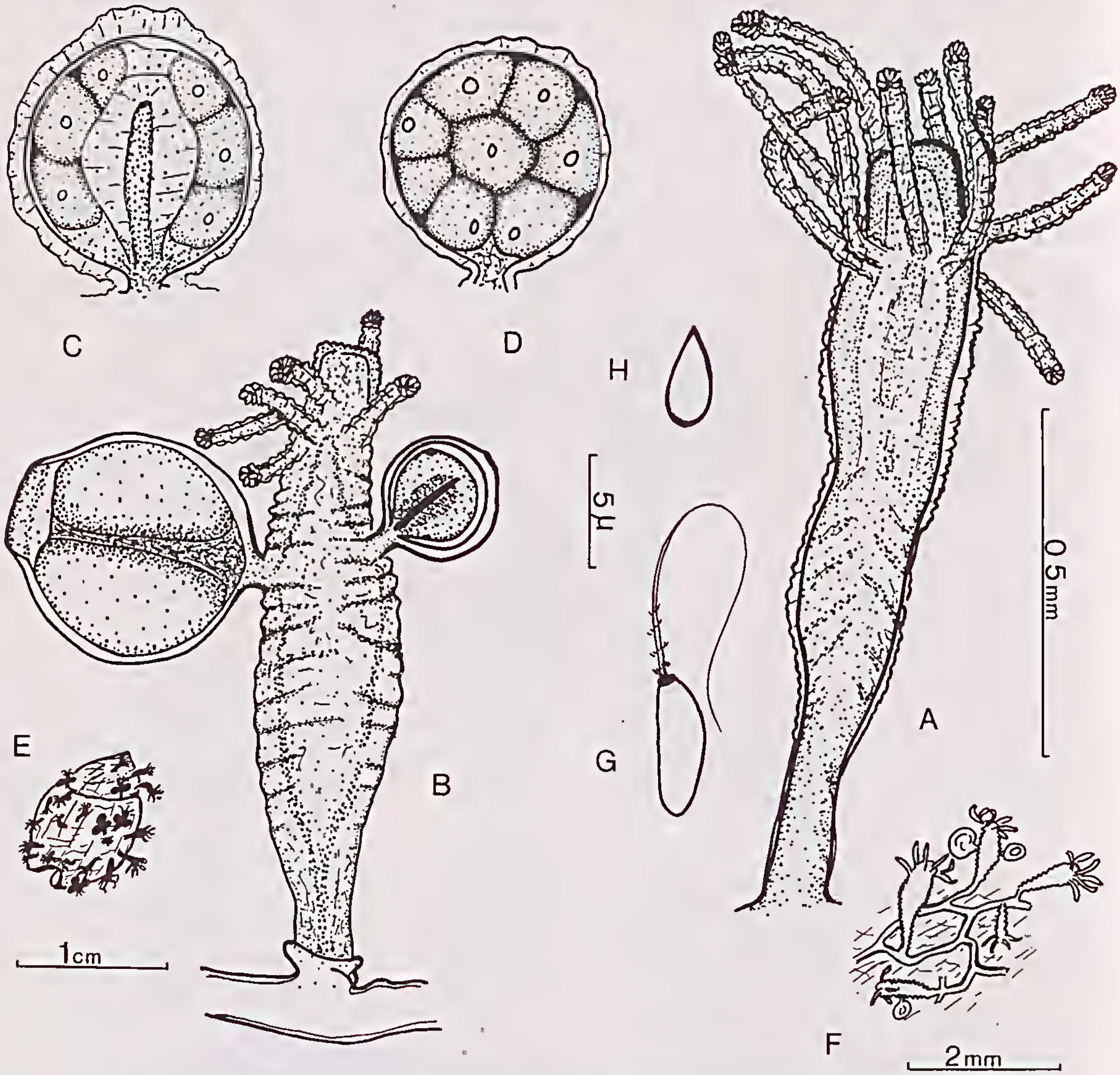

FIG. 5 — *Stylactis betkensis* n.sp. A, gastrozooid, B, gonozooid with male gonophore; C and D, stages in development of female gonophore from cleared whole mounts — C, young gonophore with eggs surrounding spadix; D, mature gonophore entirely filled with eggs (A–D drawn to same scale); E, colony on gastropod shell, *Parcannassa burchardi* (Philippi); F, part of colony on shell; G, H, nematocysts — G, ?basitrichous isorhiza, H, ?eurytele.

tudinally through the body of the hydranth as four moderately well defined canals. Tentacles 8–15 in number, reaching 0.3 mm in length (preserved), situated in a single whorl below hypostome, distal ends a little expanded and richly armed with nematocysts.

Nematocysts of two types present in gastrozooid:

— ?basitrichous isorhizas, very abundant, very few discharged, capsule bean shaped, 6.5 x 2.5 μ,

— smaller ?euryteles, less abundant, none discharged, capsule top-shaped, 4.5 x 2.5 μ.

Gonozooids rare, usually shorter than gastrozooid, 0.65–0.8 mm in length (preserved) with about 8 tentacles and up to 5 gonophores in different stages of development borne on short stalks arising from the thickened region below the tentacles, body of gonozooid frequently strongly contracted into transverse rings below whorl of gonophores.

Gonophores round or oval, male and female on separate colonies, mature gonophores reaching 0.4 mm diameter, enclosed in a tough transparent ectoderm of uniform thickness except for a thickening at the raised and flattened distal end. Immature gonophores with 4 radial canals. Mature female gonophore cryptomedusoid with 12 large eggs arranged around the radial canals, the eggs expanding at maturity to fill the entire cavity.

COLOUR: Living colonies white, perisarc of hydrorhiza brown, gonophores creamy white.

REMARKS: The absence of tentaculozooids, and even in the older colonies, the absence of a crustose layer of coenosarc over the hydrorhizal tubes clearly distinguishes this hydroid as belonging to *Stylactis*. Both hydrorhiza and proximal parts of the zooids are deeply immersed in a layer of flocculant white material covering most of the gastropod shell. A similar deposit was noted by Pennycuik (1959) surrounding the base of gastrozooids and gonozooids of *Stylactella niotha* Pennycuik 1959, from Queensland. In the present instance the flocculant material is so thick and extensive, even in parts of the shell where the hydroid has not penetrated, that it seems unlikely to be anything other than an adventitious association. Such an association would however, offer considerable protection to the hydrorhiza and stems of the hydroid colony.

Stylactis betkensis resembles *S. inermis* Allman, 1872, and *Stylactella* (*Stylactis*) *yerii* Iwasa, 1934. Reproduction of all these species is through a cryptomedusoid stage, but according to Iwasa (1934) the sporasac of *S. inermis* passes through the cryptomedusoid to a eumedusoid stage. This has not been observed in *S. betkensis*. The gastrozooid of *S. inermis* has 20 tentacles, compared to a maximum of 15 in *S. betkensis*, and the colonies of the former are reported to bear nematophores (Stechow 1923). Iwasa's revision of the genus, extended to include species added since 1934 is summarized by Bouillon (1971).

Even when adequate fertile material is available for study it is sometimes difficult to distinguish between species of certain athecate hydroids from the literature alone. In the present instance, a few characteristics of largely unknown diagnostic importance, such as the greater number of tentacles of the gonozooid (8 in *S. betkensis*, 4 in *S. yerii*), the larger mature gonophore and the distinctive pedunculate stalk of *S. betkensis* are the only characteristics which serve to distinguish between the two species. Nematocysts which would possibly provide more definitive information were not described by Iwasa for *S. yerii*, and there is also doubt as to the types of nematocysts present in *S. betkensis*.

Known from a depth of 140 m at only one locality (Misaka, Japan), *S. yerii* is fully marine, in contrast to *S. betkensis*, which occurs in brackish shallow water estuarine conditions.

This is the first record of *Stylactis* in Australian waters.

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